DOCUMENT RESUME

ED 152 560 SE 024 093

AUTHOR Perley, Gordon F.
TITLE A Guide for Developing Standard Operating Job Procedures for the Pump Station Process Wastewater Treatment Facility. SOJP No. 3.
INSTITUTION Charles County Community Coll., La Plata, Md.
SPONS AGENCY Environmental Protection Agency, Washington, D.C. Div. of Manpower Training.
PUB DATE [75]
GRANT EPA-900253
NOTE 55p.; For related documents, see SE 024 091-097; Contains occasional light and broken type

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS *Guides; Industrial Training; *Job Training; Safety; Technical Reports; *Utilities; *Waste Disposal; Water Pollution Control; *Water Resources

ABSTRACT

This is a guide for standard operating job procedures for the pump station process of wastewater treatment plants. Step-by-step instructions are given for pre-start up inspection, start-up procedures, continuous routine operation procedures, and shut-down procedures. A general description of the equipment used in the process is given. Two mathematics problems related to pumps are presented. (BB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED152560

S.O.J.P.

3

SOJP NO 3

PUMP STATION

A GUIDE FOR THE DEVELOPMENT OF

STANDARD OPERATING JOB PROCEDURES

FOR WASTE WATER TREATMENT PLANT UNIT OPERATIONS

DEVELOPED BY
CHARLES COUNTY COMMUNITY COLLEGE
LA PLATA, MARYLAND

GRANT NO 900253
MANPOWER DEVELOPMENT STAFF,
ENVIRONMENTAL PROTECTION AGENCY.

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Bernard J. Lukco

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

CERIC

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

SE 024 093

A GUIDE FOR DEVELOPING

STANDARD OPERATING JOB PROCEDURES

FOR THE

PUMP STATION
PROCESS
WASTEWATER TREATMENT FACILITY

SOJP NO 3

Developed by Charles County Community College under
a grant with the

Manpower and Training Staff
Office of Water Programs Operations
Environmental Protection Agency

Standard Operating Job Procedures for the Pump Station

This Process was developed by:

Name Gordon F. Perley

Address 9200 S. Broadway, St. Louis, Mo. 63125

Position Maintenance Supervisor Metropolitan St. Louis Sewer District

Education and Technical Background

Two years college

Fifteen years in wastewater, operations and maintenance and laboratory

Class "A" license in Wastewater from State of Missouri

Name

Address

Position

Education and Technical Background

SOJP NO 3

PAGE NO 1

Process Pump Station

1. Operation Objectives

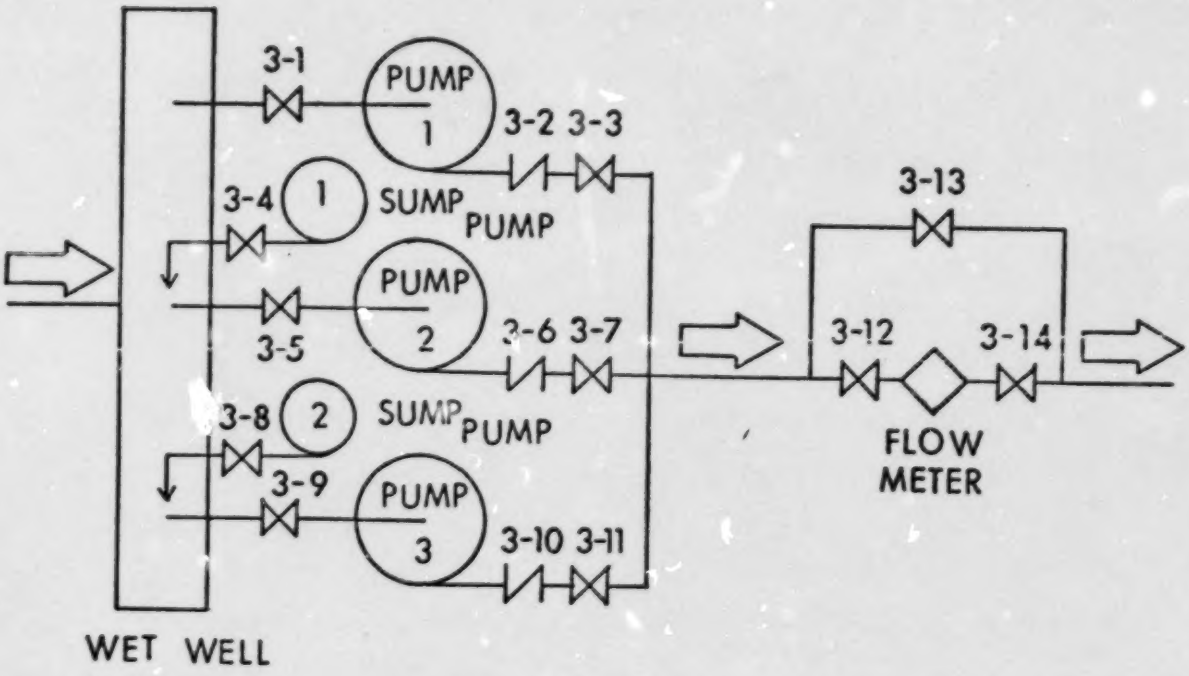
2. Brief Description of Process

Pump wastewater from low level to higher level for next unit operation.

Wastewater enters wet well, then pumped to primaries (next unit operation) using combination of variable speed, two-speed, and constant speed pumps. Wet and dry well type pump station (lift station). Pumps are controlled by bubbler control.

Process Pump Station

Flow Sheet



Process Pump Station

General Description of Equipment Used in the Process

1. Pumps, one variable speed, one two-speed, one constant speed, all centrifugal.
2. All pumps electrical driven (motors).
3. Controlled by "bubble controller" and variable speed motor to have a "Silicon Controlled Rectifier, (SCR)."
4. Flow measured by magnetic flow meter, with bypass.
5. 110v start-stop control circuit for 480v motors.
6. Wet and dry well type pit features.
7. Valves: suction, manual gate valve; discharge, pneumatic operated butterfly valve with manual override on each pump. Gate valve for each magnetic flow meter, inlet and outlet. Use rising stem gate valves if possible.
8. Main electrical breakers above ground level near main door entrance.
9. Electrical weight hoist for removal of heavy equipment.
10. Sump and two sump pumps in dry well.
11. Plant air for pressurized pump controls (item #3).
12. 110v control circuit to main control panel for audio and visual operations control status.
13. Ventilation fans and equipment for wet and dry well.
14. Seal water system for stuffing box of two pumps from plant protected water system reservoir.
15. Mechanical seal on variable speed pump.

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
A. PRESTART UP	INSPECTION PROCEDURES		
1. Safety Inspection	1. Check inlet and outlet valves to "Unit."	1. Close, lock, and tag.	V-1 XII-2
	2. Check drive power to pumps.	1. Panel breakers trip switch locked off and tagged.	
	3. Check ventilation.	1. Ventilation fans "on."	V-2, V-7
	4. Check "Unit" safety equipment (design).	1. Hand guardrails in place. 2. Guard ladders in place. 3. All lights in working order. 4. Coupling pump guards in place. 5. All electrical equipment and wiring properly insulated and grounded. 6. Suitable rubber mats placed in front of switchpanels. 7. Stair treads non-slip type.	XII-1
	5. Check safety equipment.	1. Fire extinguishers in proper locations. 2. Warning signs needed near dangerous machinery, hidden obstacles, and for any hazardous locations. 3. Gas detection meters needed. 4. Have safety harnesses, with roped spliced on. 5. Post good safety practice rules. 6. Have "First Aid Supplies" in pump room.	XII-1

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
2, Tank inspection	1. Check wet and dry well walls and floors.	1. No debris, structure sound, seals tight.	
	2. Check drain valves.	1. Free of debris, free operating. 2. Closed and tagged. 3. Painted as per contract. 4. No pitting, joints tight.	
	3. Check piping.	1. No pitting, joints tight, no leaks, pipe well supported. 2. Piping clear of debris 3. Piping painted as per contract	
	4. Check all other valves.	1. Free of debris, free operating.	V-4
	5. Inspect pumps.	1. Packing water on and dripping slowly. 2. Mechanical seal lubricated. 3. All flexible joints and couplings in alignment. 4. Pump couplings aligned and tight. 5. Interior of pump free of debris. 6. All bolts tight. 7. Pumps able to turn by hand. 8. Lubricate according to service manuals.	V-5, V-3
3, Controls and Instrument Inspection	1. Inspect magnetic flow meter.	1. Interior free of debris. 2. Power off, calibration tag certified.	XI-2

10

11

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	2. Inspect bubbler controller.	1. Pressure off, calibration tag certified. 2. Bubbler tubes not kinked, or flattened. 3. Have proper pressure to unit.	XI-1 V-6
	3. Check "Control and Alarm" circuit to main panel.	1. Power off and operational tag certified.	
	4. Check variable speed control.	1. Power off, operational tag certified for "Silicon Controlled Rectifier."	XI-3
4. Electrical Inspection	1. Inspect electrical hoist.	1. Power off and operational tag certified.	
	2. Check rotation of motors.	1. Turn power on, turn motors on momentarily to determine rotation, turn power off at panel and lock out again. 2. Qualified personnel check and inspect motor control center panel, including proper sizing of fuses, heaters etc. 3. Have disconnect switches with lock outs. 4. All light fixtures explosion proof. 5. All electrical equipment explosion proof in wet and dry well.	V-8
5. Lubrication	1. Check and/or lubricate motors, bearings.	1. See equipment service manuals of individual equipment for proper lubricants required and recommended periods between lubrication.	
	2. Check and/or lubricate pump bearings.		

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	3. Check and/or lubricate valves and other equipment as needed.	1. See equipment service manuals of individual equipment for proper lubricants and recommended periods between lubrication.	
6. Records	1. Record all name plate equipment information and location of "Equipment File Cards."		XIII-1
7. Equipment Nomenclature	1. Study parts of centrifugal pump.		V-10
	2. Study discharge of pump (gpm) and be familiar with drive power calculations.		II-1

14

15

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
B. START UP PROCEDURES			
1. Fill wet well.	1. Clear tank of all personnel.	1. Post warning sign "Unit Start Up."	VII-1 IV-2
	2. Have premarked footage marks on wet well wall.	1. Place marks where they can be seen from top outside of tank. 2. These marks are used to double check bubbler controller accuracy.	
	3. Open inlet valve to wet well.	1. Open valve slowly and fill tank to desired mark, close valve.	
	4. Check bubbler controller.	1. Turn air supply on. 2. Adjust regulator. 3. Adjust air flow indicator. 4. Open valve to bubbler. 5. After pressure has stabilized for about 30 seconds, indicator should read same as depth of liquid in wet well. 6. If indicator does not read correct depth, adjust it to indicate correct reading.	VII-2
	5. Open inlet valve to wet well.	1. Turn on high level alarm and check for operation.	

STANDARD OPERATING JOB PROCEDURES

SOJF NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
2. Equipment Start Up.	1. Turn selector switch of lift pumps on motor control panel to manual.	1. Motors are off, start one at a time from pump floor.	
	2. Open all lift pump suction valves, #1 through #3.	1. Keep discharge valves closed. Make sure all air is purged out of pumps.	VIII-3
	3. Open all pneumatic operated butterfly valves, #7, #8, #9.		
	4. Open inlet and outlet valves of magnetic flow meter, valves #10, #11.	1. When flow reaches meter, it should be on zero point with chart traveling, unit on.	
	5. Start smallest pump motor (#1).		
	6. Open small or #1. Lift pump discharge valve slightly, #4 valve.	1. This is to avoid water hammer and damage to fittings and equipment. 2. Water seal to stuffing box dripping slowly.	VIII-4
	7. Open discharge valve of #1 pump slowly to full open. Valve #4.	1. Let pump operate for 15 to 30 minutes before going to step #8, to make necessary adjustments if needed.	
	8. Check pump and motor.	1. Equipment bearings and packing should be running cool and quiet.	

18

19

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	9. Turn off #1 pump and close #7 valve (butterfly valve).		
	10. Turn off #1 pump and complete steps #3 through #9 on the two other pumps. Close respective butterfly valves (#8 or #9) after checking of pumps.	1. Start up pumps one at a time on manual.	
	11. Turn off all lift pumps and set #1 on automatic with valves #4 through #6 open.	1. Pump wet well down low enough so all pumps will not come on line at same time. Wet well inlet valve may have to be partially closed. (#7 valve will open automatically.)	
	12. Turn #2 and #3 pumps and #8 and #9 butterfly valves to automatic.	1. #8 and #9 valves open when bubbler control operates flow discharge (or pumping demand).	
	13. Check bubbler controller again.	1. To make sure correct reading with starting of desired pumping.	
	14. Bubbler control adjustments.	1. Bubbler control will have to maintain a relatively even flow without excessive starting and stopping of pumps. This control may need adjustment occasionally due to the change of flow time patterns and characteristics.	

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
		2. Motors and pumps should not short cycle causing motor overheating and unnecessary amounts of peaks in flow patterns. This can be done by changing control points (or set points) of bubbler.	VII-4
	15. Check "Silicon Controlled Rectifier" for satisfactory operation.	1. In checking out pumps and controls it will be necessary to turn some lift pump motors to off position to allow bubbler controller to activate next pump desired. 2. After check-out of system, turn lift pump motors back to automatic position.	
	16. Record ampere readings of motors.	1. Qualified personnel to complete this item.	
	17. Check timing of pneumatic valve operation.	1. Should go from closed to open position in 30 to 90 seconds. 2. Should go from open to closed position in 10 to 20 seconds.	

22

23

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
C. CONTINUOUS ROUTINE OPERATION PROCEDURES			
1. Equipment Observations (2-hour tour).	1. Check and feel bearing housings of pumps and motors that are on line.	1. These units should not develop excessive heat, lose oil or grease, or have unusual noise. 2. If you can keep your hand on these areas for at least 30 seconds, items will be usually below 130°F. This degree of heat will not harm the bearings.	V-9 V-9
	2. Check packing gland.	1. Gland and stuffing box should be cool to the hand. 2. Water should be leaking slowly, a few drops per minute. 3. Gland should be evenly tightened.	 V-9 VII-4
	3. Check control panel and switches.	1. They should be set as per instructions of supervisor of O & M specifications. 2. Depress "Test" switch to ensure bulbs are in working order.	
	4. Check bubbler controller.	1. Make sure air flow indicator is set for correct range. 2. Drain moisture out of condensate trap. 3. Make sure primary air pressure is steady. 4. Make sure controller is operating pumps satsifactorily.	

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	5. Check for equipment vibration.	1. Unusual vibration means loose bolts, couplings, etc. 2. Some foreign item may be in pump, which will have to be cleared out. 3. Pump may be air-bound, it may have to be primed.	
	6. Check pump couplings.	1. No filings and coupling operating quietly.	
	7. Check magnetic flow meter output.	1. Record readings.	
	8. Check ventilation fans.	1. Fans to be on while people in area. 2. Fans should be capable of an air change every 3 to 5 minutes.	
	9. Use senses for unusual noise and detection.	1. When you have operated this station for a period of time, you will sense things out of the ordinary which will have to be repaired. Either correct the trouble or report it to qualified personnel.	
	10. Shift change		IV-1
	11. Change charts		XIII-1

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
2. Abnormal pump conditions and equipment adjustments.	1. Checking equipment you find pump motor fails to operate.	1. Switches not set for operation. Reset heater coils in breaker panel. If motor still does not operate, lock out, tag and report to qualified personnel.	
	2. Checking discharge (gpm) of pump, you find no sewage being delivered (with motor operating).	1. Valves may be closed. 2. Coupling broken. 3. Impeller and/or piping plugged. 4. Speed too low. 5. Motor single phasing. 6. Flow meter not operating or plugged.	VIII-1
	3. Checking pump, you find not enough water being delivered.	1. Flow meter not accurate or debris in line. 2. Valves not open completely. 3. Packing worn or incorrect seal PSI. 4. Air leaks in system (suction). 5. Impeller and/or line partially plugged. 6. Pump not primed. 7. Mixture of air in sewage. 8. Speed of motor too low. 9. Mechanical defects-report it.	VIII-2
	4. Checking equipment you find pump short cycles, or loses suction.	1. Bubbler controller needs adjustment or cleaning. 2. Wet well too low at times, stoppage in sewer ahead of unit. 3. Water seal plugged. 4. Air in sewage. 5. Partially clogged pump. 6. Low head (discharge) of pump.	VIII-2 VIII-5 VIII-3

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G. F. Perley Date 12/10/72

PROCESS Pump Station Approved by

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	5. Your inspection indicates high power requirements.	1. Speed too high. 2. Head is too low (power failure). 3. Rotating elements may be binding. 4. Mechanical defects.	VIII-4
	6. Your inspection indicates a noisy pump.	1. Pump not completely primed. 2. Suction clogged. 3. Improperly lubricated. 4. Pipe strain on pump. 5. Coupling worn. 6. Mechanical defects.	
	Report unusual operation conditions to qualified personnel. Examples: High level light bulbs out; Electrical breakers chattering; Unusual water leakage; Air leakage of bubbler and/or pneumatic valve; Non-operational repairs.		
3. Housekeeping	1. Pick up all trash and keep area clean		IX-1
	2. Hose down area.	1. Periodically, water drains of pump stuffing boxes need washing down.	IX-1
	3. Wipe up any oil or grease present.	1. Periodically; oil and grease may leak from equipment.	IX-1

30

31

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	4. Keep all tools clean and in neat order.		IX-1
	5. Keep wash down hoses on racks when not in use.		IX-1
	6. Walkways and steps, keep clean and free from obstructions.	1. To prevent falls and accidents.	IX-1
	7. Wipe down motors and pumps.	1. Once per shift.	IX-1
	8. Empty trash cans.	1. Once per shift.	IX-1
	9. Keep control panel clean.		IX-1
	10. Keep piping and valves clean.		IX-1
	11. Keep floors swept clean.		IX-1
4. Sampling and analyses.	This unit process does not remove solids, B.O.D. or other material from wastewater flow and therefore is not normally sampled or analyzed.		VI-1

SOJP NO 3 Prepared by G. F. Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
5. Lubrication and preventive maintenance.		This work is usually done by qualified personnel, namely a maintenance man.	VII-5, VII-6, XIII-3
D. SHUTDOWN PROCEDURES			
		Pump stations are normally constructed so as not to be shut down for a period of many years. Equipment is installed so as to do periodically preventive maintenance, repairs, or additions without stopping operation of station.	
1. Extreme emergency shut down.	1. Close unit (wet well) inlet valve.	1. Lock out and tag.	
	2. Place small lift pump on "manual."		
	3. Turn off all lift pumps.	1. When wet well level is just above suction bell of pump. 2. Lock out and tag.	
	4. Turn off magnetic flow meter.	1. Lock out and tag.	
	5. Close unit outlet valve.	1. Lock out and tag.	

STANDARD OPERATING JOB PROCEDURES

SOJP NO 3 Prepared by G.F.Perley Date 12/10/72

PROCESS Pump Station Approved by _____

OPERATING PROCEDURES	STEP SEQUENCE	INFORMATION/OPERATING GOALS/SPECIFICATIONS	TRAINING GUIDE NOTE
	6. Turn off sump pumps.	1. Lock out and tag.	
	7. Turn off bubbler controller.	1. Lock out and tag.	
2. Drain wet well	1. Continuously ventilate wet and dry well.	1. To eliminate dangerous gases.	
	2. Use portable pump to completely drain or pump tank empty.		
3. Safety	1. Use explosive meter to check condition of atmosphere in tank, before entering wet well.		
	2. Use safety harness and hard hat when entering tank.	1. At least two men must stay on top at all times while man is in wet well.	XII-1
	3. Use sealed and grounded lights and tools in tank.		
	4. Use protective clothing while in tank.		

TRAINING GUIDE

SECTION	TOPIC
I	Operating Theory
II	Educational Concepts - Mathematics
III	Educational Concepts - Science
IV	Educational Concepts - Communications
V	Process Equipment
VI	Process Flow - Characterization
VII	Process Control
VIII	Abnormal Operations - Trouble Shooting
IX	Maintenance Practices
X	Laboratory Practices
XI	Instrumentation - Automation
XII	Safety Practices
XIII	Records Reports

OPERATING THEORY

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES

EDUCATIONAL CONCEPTS -- MATHEMATICS

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
II-1 [A.7.2]	Electricity E= Volts I= Amps. R= Resistance Unit of voltage = Volts = V = water pressure Unit of current = Amps. = A = water flow Unit of resistance = Ohms = R = water friction Problem: What size fuse should be installed to protect a 10 Hp, 480V, three-phase motor? wt = V x I x 1.73 x P.F. x % eff. wt= 10 x 746 = 480 x I x 1.73 x .80 x .90 I = 12.8	Modern Electric Controls By: J.F. McPartland
	Problem: An electrically driven pump that is 83% efficient lifts 1.1 MGD 107 feet. What is the horsepower required? $BHp = \frac{gpm \times TDH}{3960 \times \%eff} = \frac{770 \times 107}{3960 \times .83} = 25Hp$ (1.1 MGD + 1440 = 770 gpm) 1440 minutes in one day	California "Work Book" Math for sewage plant operators.

EDUCATIONAL CONCEPTS -- SCIENCE

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES

EDUCATIONAL CONCEPTS -- COMMUNICATIONS

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
IV-1 [C.1.10]	Next shift should meet with duty operator ten minutes before the start of shift to exchange information on equipment, process, troubles if any, etc., and if necessary, both men should survey the area.	
IV-2 [B.1.1.1]	Keep operational logbook for making formal notes of operational reports per shift daily, weekly, monthly, and yearly. Read and understand notes and entries of prior shifts and supervisors. The logbook has vital information for references, so therefore must be kept in a file (record) after completion. Logbook should be in diary form and bound. Records should be on design form, not scrap paper.	

PROCESS EQUIPMENT

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
V-1 [A.1.1.1]	Close plant influent valve, lock out electrical switches. Refer to flow sheet and blueprints for locations.	
V-2 [A.1.3.1]	Pump down wet well if there is any liquid in it. Ventilate well or wear self-contained "airpact." For every man in hole, have two or three above. Check for explosive or flammable liquids and gases before entering wet well. Inspect to insure no trash, forms metal, etc., left by contractor. Inspect to insure "clear" suction lines.	
V-3 [A.2.5]	Check installation, alignment, clearances, etc., of pumps. Check couplings alignment and lubrication if needed. Check lubrication of pump bearings.	See Specifications and Maintenance
V-4 [A.2.4.1]	Inspect valves, gates close and open fully, both pneumatically and manually.	
V-5 [A.2.5.1]	Turn main seal water valve off, disconnect at each pump. Open main seal water valve about 1/2 open. If there is a solenoid on H_2O seal line at pump, jumper it. Make sure all three lines are free running. Unjumper solenoid, close main seal water valve, take powerful light and shine into hole of stuffing box where water seal line connects to the two conventional packing pumps-you should be able to see the latern ring if they are packed correctly, if you can not see the ring, repack pump. Reconnect seal line to pumps.	
V-6 [..3.2,1]	Compressor has been checked out so check to see if air gauges, switches, circuits, relays, etc., are operational of bubble-system.	
V-7 [A.1.3.1]	Start ventilation system and check performance. Design should be around not less than 12 air changes per hour with both supply and exhaust fans on.	

PROCESS EQUIPMENT

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
V-8 [A.4.2.1]	Check motors for correct rotation. Note: do not run pump motors more than a "start bump" without liquid in pump. If for some reason pump motor must be operated now, disconnect coupling and reconnect when finished.	
V-9 [C.1.1.1] [C.1.1.2] [C.1.2.1] [C.1.2.2]	Check equipment, instrumentation, electrical equipment every two hours. Use back of hand for feeling temperature of things, use senses-all of them. Have a formal check list and operators initial it. Example: (List only important items.)	

PUMP STATION

Date	Equipment	Time	Initial	Remarks
4-4-72	#1 pump packing	9AM	GP	Adjusted
4-4-72	#1 pump bearings	9AM	GP	OK
4-4-72	#1 motor and bearings	9AM	GP	OK
4-4-72	#1 pump packing	9AM	GP	Off line
4-4-72	#2 pump packing	9AM	GP	

PROCESS EQUIPMENT

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
V-10 [A.7.1]	PUMP NOMENCLATURE NAME THE PARTS OF THE PUMP A SUCTION B IMPELLER VANE C IMPELLER D DISCHARGE E VOLUTE OR CASING F PACKING RINGS G PUMP SHAFT H WATER SEAL LINE I LANTERN RING J GLAND K STUFFING BOX	

PROCESS FLOW -- CHARACTERIZATION

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
VI-1 [C.4]	This is a pumping operation, no settling or reduction but an operator still needs to know what is and may be passing through his pumps.	Manual 11 WPCF pages 4-8 Texas Manual for Sewage Plant Operators Chapter 11

PROCESS CONTROL

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
VII-1 [B.1.1.1]	Items needed on line before flow enters wet well. 1. High and low pressure air and regulator adjustments. 2. Seal water pressure. 3. Mag. Meter in ready. 4. Sump pumps on "auto." 5. All electrical switches in "ready."	
VII-2 [B.1.4.6]	Open flow into wet well, slowly. Check for predetermined liquid level in wet well at which bubbler is just in liquid. Make adjustments if necessary.	
VIII-3 [B.2.2.1]	Open all suction valves, open *unair lock valve at top discharge side of volute to unair lock pumps. Check packing gland area, no leakage should be seen yet, if there is leakage, tighten slightly. Be sure drain valves are closed. When pumps are unairlocked turn off unair-lock valve. *Do not use petcock valve, stops up too easy, use at least 1/2" or larger gate valve.	
VIII-4 [B.2.6.2] [B.2.14.2] [C.1.2.3]	Check bubbler. Set it for "auto." Check for accuracy of level in wet well with setting of unit for pumping and in correct sequence. When each pump comes on line, check seals for correct leakage and correct water seal pressure. Water seal pressure should be 3 to 6 psi higher than discharge pressure of pump at pump, leakage should be a <u>few</u> drops per min. Make necessary adjustments if needed.	

PROCESS CONTROL

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
VII-5 [C.5]	Normally take one pump at a time out of service for maintenance or preventive maintenance check. Turn off switch and lock out. Close suction and discharge valves and drain pump. After inspection and/or repairs, go through procedure_____start up.	
VII-6 [C.5]	When pump is taken out of service be sure to change selection of "bubbler controller" so the down pump will be eliminated from sequence and not interfere or disturb operation of station.	
VII-7 [D]	The pump station should never be taken completely out of operation except for extreme emergency or "power failure." Restart as soon as possible and go through procedure start up this chapter.	

ABNORMAL OPERATION -- TROUBLE SHOOTING

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
VIII-1 [C.2.2.5]	Qualified personnel check whether motor is directly across the line and receiving full voltage. Single phasing will cause hot motor. Check operating conditions, open valve. Inspect piping, impeller, and clean out.	WPCF Manual Pages 15 and 16
VIII-2 [C.2.3.1] [C.2.4.1]	Turn off pump, close suction and discharge valves and put unit under pressure. Place a gauge in line. Will indicate leakage with a drop in pressure. A 1% air leak may cause a 10% decrease in capacity. Repair or report. Check operating conditions and correct.	Texas Manual for Sewage Plant Operators Chapter #7
VIII-3 [C.2.4.2]	Turn off, inspect seal line, regulator, and position of seal cage in stuffing box. Report to qualified personnel. Qualified personnel may have to vent suction back to wet well.	Maintenance Engineering Handbook McGraw-Hill 9-143-148
VIII-4 [C.2.5.1]	Qualified personnel check motor and SCR unit. This happens sometimes after a power failure. Partially close discharge valve until wet well is normal depth, then open completely.	
VIII-5 [C.2.4.1]	Frequently due to power failures or other unforseen circumstances the wet well fills up to an unusual level, thus lowering the head on the pump below the normal minimum operating head. If the person selecting the pump is not aware that such a condition could happen the motors will not stay on the line. This happens because there is an increase in the power requirements over those of the normal minimum operating head.	

MAINTENANCE PRACTICES

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
IX-1 [C.3.1] [C.3.2.1] [C.3.3.1] [C.3.4] [C.3.5] [C.3.6.1] [C.3.7.1] [C.3.9] [C.3.10] [C.3.11] [C.3.8.1]	Keep area clean at all times. Any mess should be cleaned up as soon as possible, do not leave for other shifts to clean it up. It is easier to clean when fresh and will not harm painted surfaces if it is not left on for long period of time. Safety and cleanliness go hand in hand. Keep all drains open and free.	

LABORATORY PRACTICES

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES

INSTRUMENTATION -- AUTOMATION

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
XI-1 [A.3.2.1]	Bubbler system These pneumatic systems are designed for either manual or automatic operation. The position of selection for which of the three pumps will be lead pump will depend on weather and flow conditions. A number of operational alternatives are available with switches located at control panel. The pumping station operates with increased pumping rates as the water level rises in the wet well. A "Controller" in a penumatic control panel provides the automatic control. A fast rise (about three feet per minute) of water level in wet well will cause all three pumps to come on line. The normal pump selection will be vari-speed pump lead, low dual speed second, high dual speed third, constant speed last.	Manufacturer's Service Manual
XI-2 [A.3.1.2]	Magnetic flow meter is a velocity meter, fluid flow rate device that utilizes, as the process detection method, the characteristic of a metered fluid to produce an induced voltage when flowing through a magnetic fluid. The amplitude of the voltage thus generated is directly proportional to the flow rate of the metered fluid. The interior of the unit has the following items: Line and balancing voltage interconnection. Signal interconnection. Calibrations components. Magnet coils. Meter electrode. Laminated iron core. Meter pipe section. Maintenance by qualified personnel only! Note: See chapter 13a this manual for more information.	Manufacturer's Service Manual

INSTRUMENTATION -- AUTOMATION

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
XI-3 [A.3.4.1]	SCR controls are designed to convert power from an alternating current source to a direct current type of current to control precisely the speed, horsepower and torque of the driving motor. This control is far more flexible than comparable mechanical repairs. The unit is all solid-state unit employing silicon controlled rectifiers and other heavy-duty components as active elements.	

SAFETY PRACTICES

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
XII-1 [A.1.4.1-7] [A.1.5.1-6] [D.3.2.1]	Before entering wet well or other like structures, be safety conscious and have correct safety equipment such as: 1. Oxygen-deficiency indicator 2. Safety harness and rope 3. Combustible gas indicator 4. Good, safe ladder 5. Compressed air mask 6. Plenty of manpower 7. Safety lighting equipment 8. Hard hat 9. Proper ventilation or portable blowers 10. Protective clothing 11. Etc.	WPCF Manual #11
XII-2 [A.1.1.1]	Tags are for your protection and the protection of equipment. Give name, date, and reason for lock out.	

RECORDS -- REPORTS

TRAINING GUIDE NOTE	TRAINING INFO: THEORY/CONCEPTS/CALCULATIONS/ TECHNIQUES	REFERENCES/INSTRUCTIONAL RESOURCES
XIII-1 [A.6.1] [C.1.11]	All items checked and inspected should be noted on report such as amps of motors, pumps alignment OK, clearances OK, couplings OK, valves OK (which ones), etc. Record amp. test of pump motors. All process and other important equipment should have elapse time hr. clocks. These clocks should be read once a month (on the same day of the month) and recorded. Flow charts, totalizer, etc. See WPCF Manual #11 page 16.	
XIII-3 [C.5]	Record inspection, elapse hrs. of unit, repairs if any made.	